WHAT IS CLAIMED IS:

1. In a biochip reader for reading image data of a plurality of samples using an optical detector by irradiating light at a biochip having said plurality of samples arranged thereon in spots or arrays, the improvement comprising:

arranging means for arranging multiple pieces of spectroscopic information of a sample in spaces among images.

2. The reader of claim 1, wherein said arranging means comprises a grating, a combination of an optical filter and optical shift means, or a Fourier spectrometer, disposed between said plurality of samples and said optical detector.

3. The reader of claim 1, wherein said arranging means comprises means for developing spectroscopic information on said optical detector in a two dimensional manner when said plurality of samples are arranged in spots.

4. The reader of claim 1, wherein said arranging means comprises a microscope selected from the group consisting of a scanning confocal microscope, a non-scanning confocal microscope, and a dual grating excitation microscope.

5. The reader of claim 1, further comprising separating means for separating signals of said spectroscopic information from noise by using known spectra and a regression method.

6. The reader of claim 1, further comprising aperture means for restricting area of spectroscopy, said aperture means being aligned with position of each sample or with a part of each sample.

7. In a biochip reader for reading image data of a plurality of samples using an optical detector by irradiating light at a

biochip having said plurality of samples arranged in spots or arrays thereon, the improvement comprising a non-scanning confocal microscope for reading said image data, said microscope comprising an aperture positioned to be optically conjugate with position of an image of a sample or part of said sample in a given single image.

8. The reader of claim 7, wherein said microscope comprises beam condensing means on a light source side of said aperture.

9. In a biochip reader for reading image data of a plurality of samples using an optical detector by irradiating light at a biochip having said plurality of samples arranged in spots or arrays thereon, the improvement comprising a non-scanning confocal microscope for reading said image data, said microscope comprising condensing means having a focal point thereof positioned to be optically conjugate with position of an image of a sample or part of said sample in a given single image.

10. A biochip reader comprising:

a light source for emitting excitation light;

a dichroic mirror for reflecting said excitation or allowing said excitation light to pass through said dichroic mirror;

an objective lens for condensing light that has been reflected by or passed through said dichroic mirror onto a biochip and projecting fluorescent light produced at said biochip onto said dichroic mirror;

an optical detector for detecting said fluorescent light; and

a lense for condensing said fluorescent light that is reflected by or passed through said dichroic mirror unto said optical detector;

wherein said biochip comprises a transparent substrate to allow

passage of said excitation light and said fluorescent light, and wherein said excitation light is irradiated from a side of said biochip which is opposite to a side on which samples to be analyzed are arranged.

11. The reader of claim 10, wherein said objective lens is an immersion lens.

12. The reader of claim 10, wherein said objective lens is a water immersion lens or oil immersion lens.

13. The reader of claim 10, wherein said objective lens is a solid immersion lens.

14. The reader of claim 10, wherein components forming an optical system therein comprise a confocal optical system.

15. The reader of claim 10, wherein said biochip comprises an anti-reflection coating formed on one side thereof opposite to a side on which said samples are arranged.

16. The reader of claim 10, wherein said substrate comprises an anti-reflection coating formed on a surface thereof.

17. The reader of claim 16, wherein said anti-reflection coating comprises an indium tin oxide film.

18. The reader of claim 10, wherein said samples are DNA segments.

19. The dreader of claim 10, wherein said samples are RNA segments.

20. The reader of claim 10, wherein said samples are protein segments.

21. The reader of claim 10, wherein said samples are sugar chain segments.

22. The reader as defined in any of claims 1 to 9, wherein said biochip comprises a transparent substrate to allow passage of excitation light and fluorescent light, and wherein said excitation light is irradiated from one side of said biochip which is opposite to a side where said plurality of samples are arranged.

23. An electrophoresis system for conducting electrophoresis of a sample marked with fluorescent coloring matter in a lane area so that a fluorescence pattern thereof that is produced is read, said system comprising:

an electrophoresis unit for conducting electrophoresis by flowing a plurality of samples, prepared by combining various types of target substance with different types of fluorescent coloring matter into a same lane of said lane area; and

a confocal microscope or a fluorescence imaging system wherein samples in said lane area are scanned with excitation light and poly- chromatic fluorescence patterns of said samples produced by irradiating said excitation light are concurrently detected through a plurality of filters having different transmission properties,

whereby a plurality of electrophoretic patterns are detected concurrently.

24. a three -dimensional electrophoresis system for conducting electrophoresis of a sample marked with fluorescent coloring material in a lane area so that a fluorescence pattern thereof that is produced is read, said system comprising:

an electrophoresis unit for conducting electrophoresis by flowing various types of target substance into said lane area and by applying a gradient in direction of depth of said sample; and

-29-

a microscope selected from the group consisting of a scanning confocal microscope , a non-scanning confocal microscope, and 2 photon excitation microscope, said microscope being configured so that a sample in said lane area is scanned with excitation light and a fluorescence pattern of said sample produced by irradiating with said excitation light is detected, whereby three-dimensional position and concentration of said sample are obtained.

25. The system of claim 24, comprising means for applying different physical gradients to said electrophoresis unit in two horizontal directions and in one vertical direction thereby to perform sample separation concurrently on three axis.

26. The system of claim 24, comprising means for placing samples and markers in a depth direction in said electrophoresis unit.

27. The system of claim 24, wherein said non-scanning confocal microscope comprises an aperture positioned to be optically conjugate with position of an image of said sample or part of said sample in a given single image.

28. The system of claim 27, wherein said non-scanning confocal microscope further comprises beam condensing means on a light source side of said aperture.

29. The system of claim 24, wherein said non-scanning confocal microscope comprises beam condensing means having a focal point thereof positioned to be optically conjugate with position of an image of a sample or part of said sample in a given single image.

30. The system defined in any of claim 23 or 24, wherein said confocal microscope comprises beam condensing means on a light source side of a confocal aperture.

31. The system of claim 24, wherein distribution of density in the depth direction is realized by wetting one side of a gel with a highly concentrate solution, applying a density gradient in the depth direction by means of centrifugation, or stacking multiple layers of gel with different concentrations.

32. The reader as defined in any of claims 1 to 3 and 5 to 9, wherein said arranging means comprises a microscope selected from the group consisting of a scanning confocal microscope, a non-scanning confocal microscope, and 2 photon excitation microscope, said microscope being configured so that a sample scanned with excitation light and a fluorescent pattern of said sample produced by said excitation light is detected.